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ABSTRACT

University admission requirements and achievement levels at the time of secondary school graduation are compared for five countries: the United States, the Soviet Union, France, Japan, and West Germany. Emphasis is placed upon the structural and cultural differences in the educational systems of these countries. In addition to college admission requirements for each country, attention is directed to high school graduation requirements in mathematics, science, and foreign languages. Included are case studies of high school exit examinations. An important difference between the United States and the other four countries is the greater accessibility of secondary schools and colleges in the United States. In contrast to the United States, the other four industrialized countries view education as having the function of awakening the student's sense of participation in, and relationship to, a national community and national tradition. The Soviet Union, France, and Japan have highly centralized educational systems in which important decisions are made at the national level. Only West Germany has a mixed regional and state central system. In the other four countries, access to higher education is controlled by national examinations that are based on national academic standards. Numerous tables and a four-page bibliography conclude the document. (SW)

University Admission Requirements and Secondary School Graduation

Achievement in Five Industrialized Countries: What Can We Learn from the Comparison?

School of Education

Maresi Nerad

February 1986

Introduction

This study* compares present university admission requirements and achievement levels upon secondary school graduation in the United States, the Soviet Union, France, Japan and West Germany. It argues that the apparently simple taks of comparing admission standards is extremely complex and that only comparison of underlying structures and educational values of each nation are useful for policy questions for U.S. educators.

Many of the recent national reports--the "Nation at Risk" for example--produce an underlying hope that the educational crisis in the U.S. can be remedied by shopping at other nation's educational system. The report suggests, that we only need to pick out the raisins of each system, mix them together, give them an American flavor and we will get successful educational reforms. Recently, the California Round Table of Educational Opportunity requested a comparative report on university admission and secondary school exit requirements in Japan, the Soviet Union, France, Germany and the United States. What do we learn from such a comparison? What relevant policy questions are useful for the U.S. education system?

To avoid simplified interpretations of educational requirements and achievements, this study emphasizes the structural and cultural differences in the education systems of the five countries under discussion. This report is divided into three parts. The first section describes university admission requirements in each country. When necessary, references will be made to the particular structure and nature of each country's overall education system. The second part describes each country's high school graduation requirements in mathematics, science and foreign languages. Some case studies of high school exit examinations will be presented and findings in the literature on comparative tested achievement levels upon completion of high school are reviewed. The data are drawn from reports prepared for the International Association for the Evaluation of Educational Achievement, the Organization for Economic Cooperation and Development (OECD), the European Institute of Education and Social Policy, and the National Commission on Excellence in Education. The conclusions highlight the usefulness as well as the problems of comparative studies of various countries' education systems for policy makers.

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*An earlier version of this paper was prepared for the California Round Table on Educational Opportunity (1984).

University Admission Requirements

University admission in France, Japan, the Soviet Union and the Federal Republic of Germany requires the successful passing of the upper-secondary school, which includes an extensive mandatory final examination. In France and Germany, high school graduates who pass this examination (Baccalauréat and Abitur) are officially eligible to enter all universities. Japan and the Soviet Union have separate university entrance examinations. These examinations are closely tied to the academic achievements required of high school students, unlike the Scholastic Aptitude Test (SAT) in the United States, which tests aptitude.

Japan

Probably the most notorious of all university admission requirements are the Japanese University Entrance Examinations. Thomas Rohlen, in his book Japan's High Schools (1983), calls them a "national obsession." Higher education in Japan consists of public and private universities, junior colleges, and higher technical colleges. (Figure 1 depicts the Japanese education system.) Applicants for the most prestigious public national universities must take three stages of examinations to move from secondary schools to universities. First, the First Stage National Common Test, which is a standard screening examination, must be taken. It comprises 7 subjects (Japanese, English, mathematics, two social science and two natural science subjects) and is roughly comparable to the United States' SAT. Those who successfully pass this test are allowed to take an essay type examination (Second Test Examination) administered by a particular national university. The final judgment is made by integrating the grades on these two examinations. The quality of the universities differs enormously and so do their examinations, which last two days. A student cannot apply to more than two public universities because examination schedules overlap.

Each private university writes its own examination and administers it once a year on its own campus. These examinations encompass three or four subjects and measure the abilities and aptitudes required by that particular university. After the written examination, the candidate is then interviewed by the department to which he or she applied. The examination schedules for private universities do not overlap; hence, a student may apply to many private universities.

The Second Text Examinations and the private university entrance exams consist of two parts: a compulsory section and an elective section. Each department specifies the choices its applicants have. The compulsory subjects are mathematics, English, and Japanese. Mathematics and literature are divided into several degrees of difficulty, according to the particular

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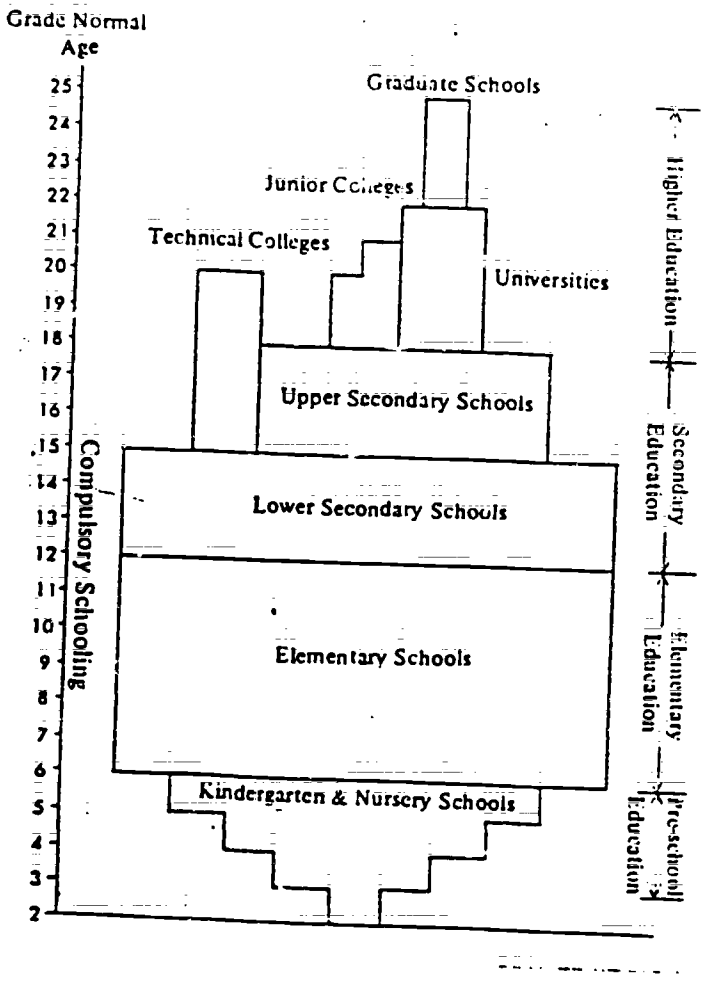
Figure 1: The Educational System of Japan



Source: Student Guide to Japan and Questions of General Education
Keigaku publishing, 1972, p.12

relevance for the department to which the student has applied. For example, science, medicine, and engineering students are heavily tested in mathematics and science and in one social science topic of their choice. Half of their total score will come from their score in math and science. Applicants for the humanities, education, social sciences, and law are required to take all tests in social studies and Japanese, but they are allowed to skip the most difficult math section and are required to take only one science of their choice. Consequently, all students must concentrate on mathematics, English, Japanese, and must also specialize to a degree in either science or social science, depending on their career intentions. According to Rohlen (1983), it is not possible to change departments once accepted by a university. Changing universities means beginning again as a freshman.

The exam questions of the First Stage National Common Test are primarily short-answer and multiple-choice questions. Proficiency in writing and speaking a foreign language is not tested. Emphasis is on mastery of facts, control over details, and practiced skill in the application of mathematical and scientific principles. The exams are not designed to test aptitude and they are based on nationally standardized public school curriculum. In the United States, on the contrary, students are admitted on the basis of achievement and their assumed potential as measured by the SAT. Moreover, the SAT is oriented towards university requirements.

In 1980, 90% of Japanese youth graduated from high school and 53% of them applied to one or more institutions of higher learning. The number of successful candidates represented 38% of all the young people in comparable age groups nationwide, the second largest percentage after the United States (75%). The competition to enter a prestigious university is extremely great. Only 10% of all eligible high school graduates take the First Stage National Common test. The rest of the students (about 90%) take the Private University Examinations. For example, at the prestigious Tokyo University, 33% of the successful applicants in 1980 had taken the test a second time and 10% of the students took it three times or more. The most successful candidates attended "cram schools" and did about five hours of homework a day for at least three years before taking the exam. In Japan, the students' performance during two days of testing -- after 12 years of schooling -- decides whether the students will be allowed to enter the university, which in turn determines the direction of their future lives.

Soviet Union

In the Soviet Union, students who pursue a higher education must have completed their secondary education. Secondary schools

may provide a general education, vocational-technical education or specialized education. The completion of secondary schools comes after 10 years of schooling, compared to 12 years in Japan and the United States and 13 years in France and Germany. Students are chosen on the basis of competitive entrance examinations and secondary school grades. Soviet universities' entrance examinations are designed to measure achievement, rather than aptitude.

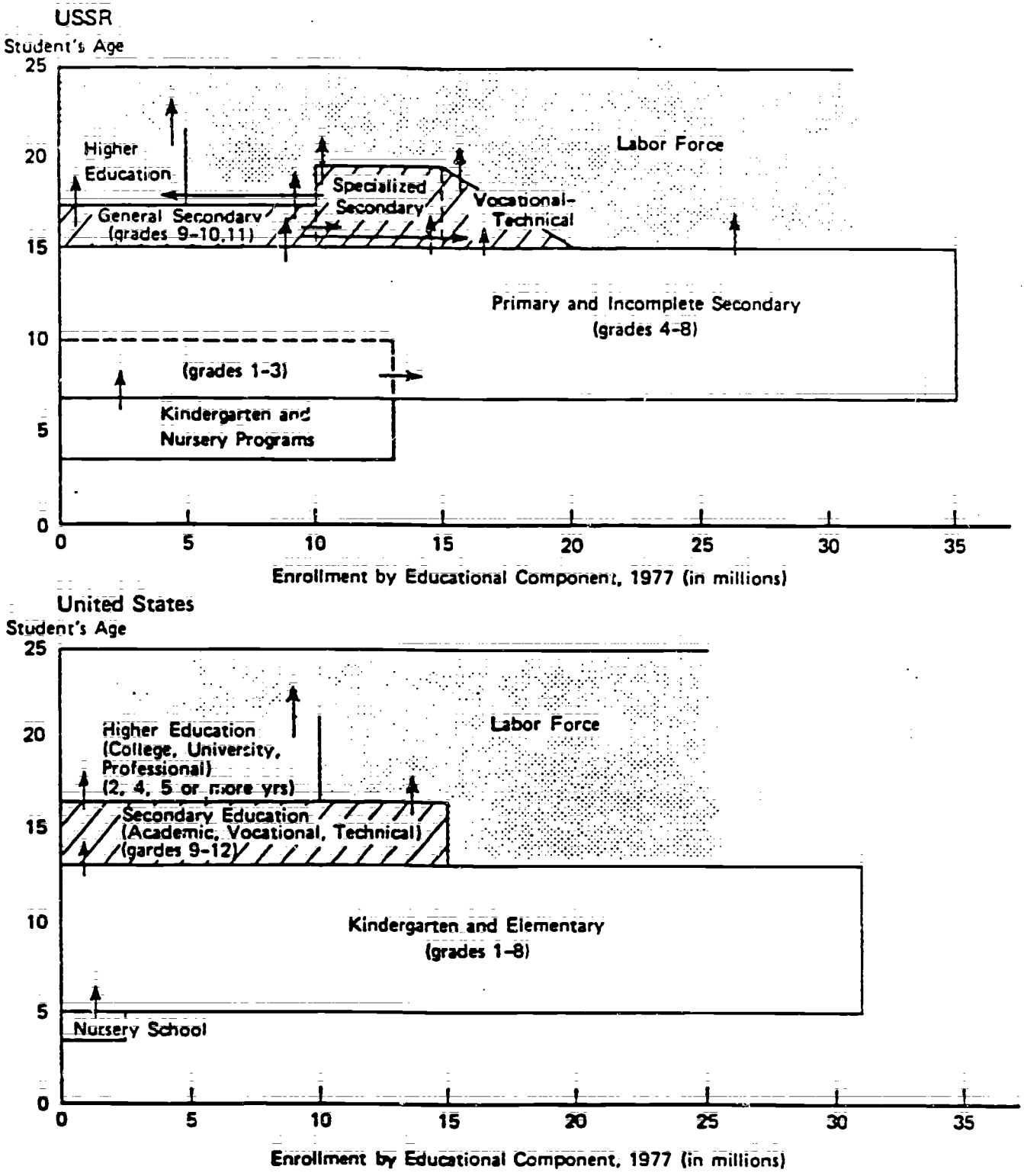
Soviet students choose their field of specialization before entrance to a university, as is the case in Europe and Japan. They apply to a specific department rather than to the university as a whole. The Soviet system of higher education is comprised of 62 universities, 68 polytechnical institutes, and other 712 specialized institutes. (Figure 2 depicts the general structure of the Soviet educational system.) There are full-time day institutions for students under 35 years of age and evening correspondence study programs without age restriction. As individual institutions formulate their own examination questions, they can vary their own standards of admission as is the case in Japan. Depending on the institution, examinations are required in three to five of the following subjects: Russian language and literature, mathematics, physics, chemistry, history geography, and foreign languages. There are written and oral examinations. Annual admissions quotas for each discipline within each higher education institution are determined by the central government on the basis of a national demand schedule for various specialists. Every application to a university must be accompanied with the applicant's personal documents. Thus, only one application can be made at any one time. France and West Germany also set quotas for certain disciplines, but the quotas are calculated by space available at each university. A 1980 Stanford Research Institute International study reports that "taking the USSR as a whole, quotas probably function as a more important determinant of the overall academic ability of all students admitted to the higher educational establishments than do entrance examinations, in that at those institutions that receive relatively few applicants compared with the number of places available, less qualified students are admitted so as to fill the admissions quotas" (p. 9).

While all students who have completed a secondary education are eligible to apply to an institution of higher education, general secondary schools are essentially the training ground for higher education. According to Joseph Zajda in his book, Education in the USSR (1980), those who are admitted scored highest on the entrance examinations. Special concessions are made to top secondary students who hold gold medals for academic excellence; they need to pass only one examination.

In 1978, 97% of the Soviet Union's youth completed the 10-year secondary general school. Twenty five percent of them

Figure 2

The Structure of Education in the Soviet Union and the United States



Source: USSR: Trends and Prospects in Educational Attainment 1959-85, p. 3, CIA ER 79-10344, (June 1979).

were admitted to higher education (National Economy of the USSR in 1979, pp. 488, 499).

France

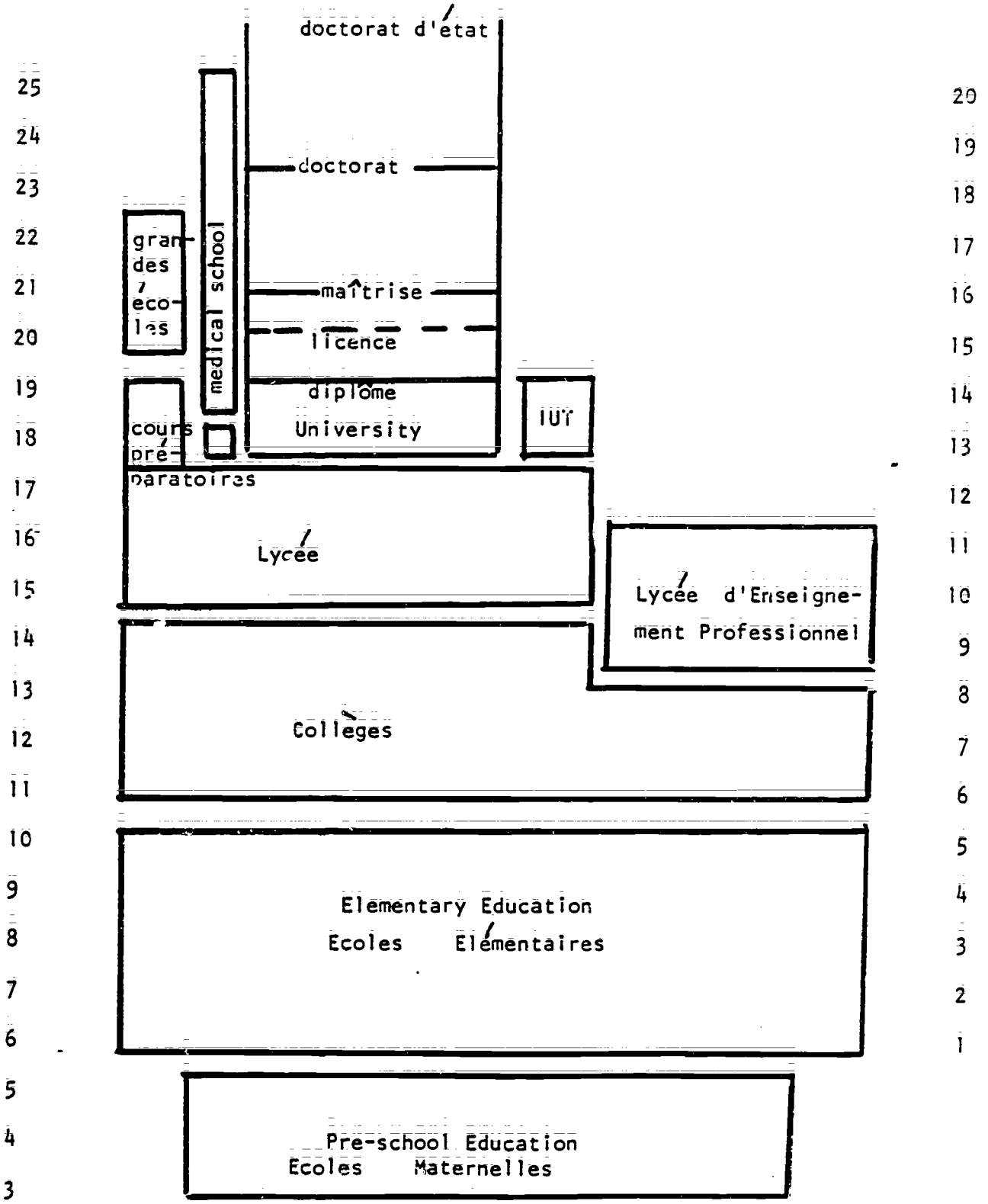
In France, the general requirement for university admission is successfully passing the baccalauréat. The baccalauréat is the required exit examination taken at the end of the academic secondary school (Lycée) after 12 years of schooling. Those who pass the Baccalauréat C and have a high grade point average ("la mention") may register in any department of a university. Higher education consists of the universities, the grandes écoles, and the University Institutes of Technology (IUT). (Figure 3 shows the general structure of the French education system.) The grandes écoles, which train high level personnel for government, industry, and medical schools, administer rigorous competitive entrance examinations. Before entering medical school, students have to pass one year of pre-medical schooling. Since school is compulsory from the age of six, French students take the baccalauréat at 18 years of age.

There are basically six different baccalauréats, known by letters A, B, C, D and E, according to the focus of the secondary school. "Bac A" focuses on literature, linguistics, and philosophy; "Bac B" emphasizes economics and social sciences; "Bac C" stresses mathematics and physical sciences; "Bac D" focuses on natural sciences; and "Bac E" demands specific knowledge in industrial science and technology. Baccalauréats A, B, C, D and E are general examinations; Baccalauréat F is a technical examination. Presently, there are many more combinations of subjects possible. These examinations are prepared by the Ministry of Education and are uniform throughout the entire country.

To pass this examination, an average mark of 10 out of 20 is required. The highest grade point average ("la mention") is 20. It is nearly impossible to attain. Everyone who scores above 14 has more possibilities in terms of disciplines of study and choices among types of higher education institutions. Students with "Bac C" and a grade point average of 14 or above have the most choices in terms of their direction of studies. If a student passes "Bac E," he or she may enter science faculties at the university and the University Institutes of Technology.

Admission to the grandes écoles is doubly selective. Students must have passed the baccalauréat, which allows them to enter preparatory classes for the grandes écoles. For two years, these classes prepare students for the competitive examination (concours) leading to entrance into a grande école. There is a hierarchy among these elite schools, both within a field of study

Figure 3: The Educational System of France



and even more so among the different professions. Only students who score very high gain admission to the most prestigious schools. Those students who fail the examination can enter the third year of a university, since the preparatory classes are equivalent to higher education study; however, administratively, these preparatory classes are part of the secondary education system. The grandes écoles only admit 5% of the total age group.

In 1978, 85% of the students who held the general baccalauréat and 51% who had a technical baccalaureat transferred from secondary to higher education (Organization for Economic Co-operation and Development, 1983, p. 233). Altogether, 28% of the 18-20 year old population entered higher education.

In sum, the basic French university entrance requirement is the baccalauréat. Due to the constant increase in the number of students wanting to enter prestigious fields, such as medicine, pharmacology and dentistry, an additional selection process (numerus clausus) is employed. Each year, the number of admissions in these subjects is determined by a central office in Paris. Faculty and departments are increasingly demanding a baccalauréat with a strong mathematics component. In fact, students with the "Bac C" option (mathematics and physical science) and a high grade point average are considered superior to others. They are also most likely to continue in preparatory classes for the grandes écoles. The particular fields of study a student has chosen in secondary school largely determine the direction of his or her university study and later professional life.

Federal Republic of Germany

In the Federal Republic of Germany, everyone who holds the certificate of general qualification (Abitur) is allowed to enter a university. There are no major differences in status among the universities; therefore, there is no competition among the universities to get the best students, as is the case in the United States and Japan. Higher education is free in West Germany.

Higher education in West Germany consists of 55 universities, 96 Fachhochschulen (colleges of technology or vocational colleges), 26 colleges of the arts, 12 technical colleges and 9 comprehensive universities (Gesamthochschulen). (Figure 4 illustrates the German education system.) With the exception of the theological colleges, higher education is state-controlled. There is only one private university, an alternative medical school which opened in 1983. Students who want to enter the Fachhochschule must have graduated from a higher technical school which administers a final examination after 12 years of schooling; students must also have practical work experience. All other higher education institutions require the Abitur.

Figure 4: The Educational System of the Federal Republic of Germany

Education System:

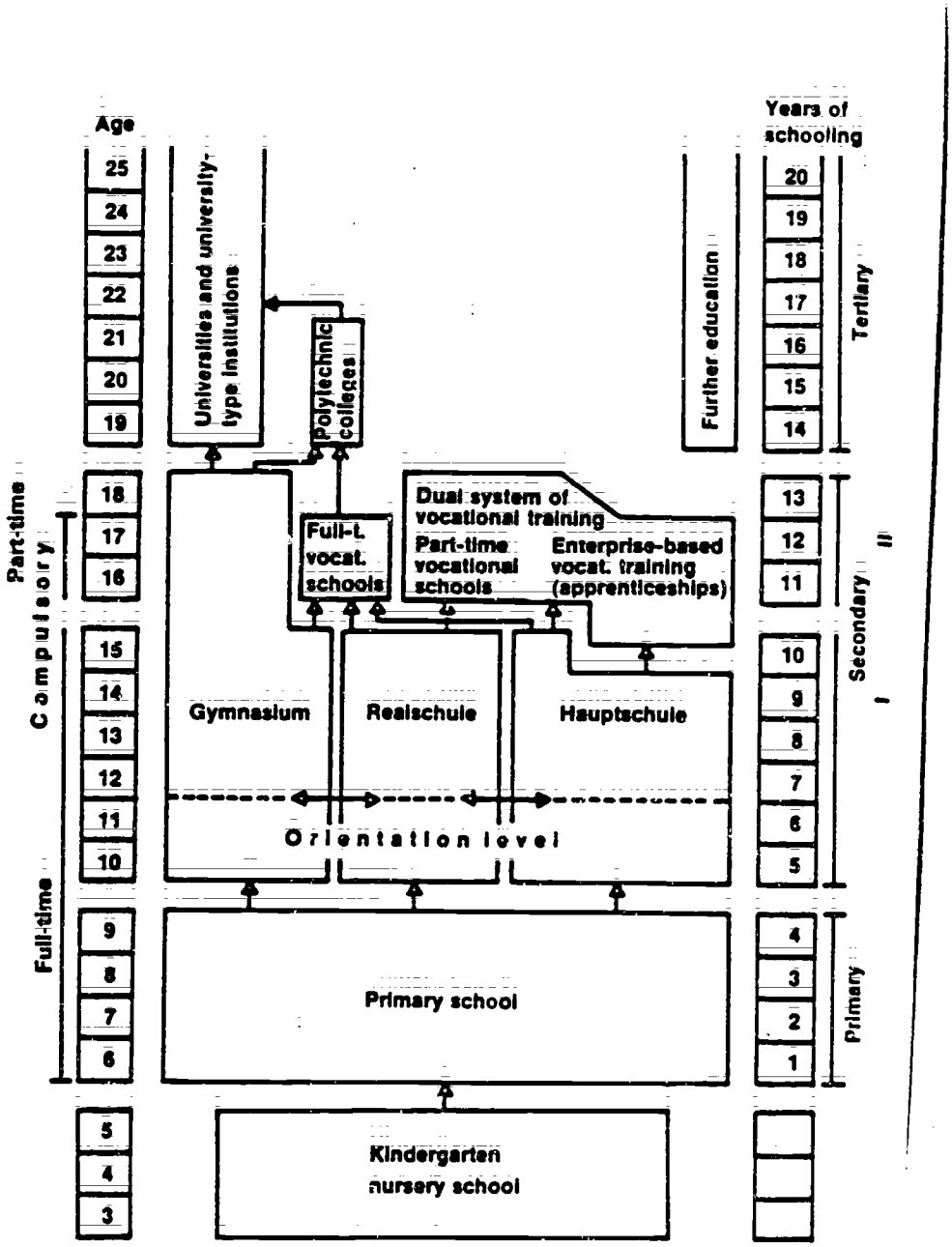


Figure 2.1. Chart of the Educational System in the Federal Republic of Germany, 1980

Source: Max Planck Institute for Human Development and Education
Between Elite and Mass Education, Education in the Federal Republic of Germany.
Albany:State University of New York Press, 1983

The Abitur must be taken at the completion of university preparatory schools (Gymnasien) after 13 years of schooling. It consists of a written and an oral portion and, in some subjects (physical education, music, art, and the sciences), a portion which includes practical demonstration of skill. Students take this examination before an examination board at their school. The examination questions are designed by the school and approved by the Ministry of Education of the particular State. Only Bavaria has standardized exam questions. In effect, each school has a slightly different Abitur; therefore, it is difficult to compare France's baccalauréat with the Abitur.

The traditional types of Gymnasien may focus on modern languages, mathematics and science, or the classics. In addition, there are other types which emphasize social sciences, economics, engineering and technical sciences, music, and agriculture. In all cases, the Abitur requires a written examination in German and mathematics. In the language-oriented Gymnasien, written essay examinations are also required in two foreign languages. In the other Gymnasien, written essay examinations are given in one foreign language and in a subject directly related to the school's academic emphasis, such as physics, economics, music and other subjects. Students must show deep and broad knowledge in these subjects. Since 1970, students are permitted to transfer from a higher technical secondary school (Fachoberschule) to a university to study specific subjects. All students who enter higher education apply to enter a specific discipline rather than a particular university. All studies lead to a diploma equivalent to an American Master of Arts degree. In West Germany's higher education system, Bachelor of Arts degrees are not awarded.

Because of the great increase in the number of secondary school graduates, admission restrictions have been instituted for certain popular disciplines. Since 1973, a central state agency for student placement exists to allocate available places in the universities. Applicants for such disciplines as medicine, pharmacology, dentistry, psychology and biology are selected by the Central Office of Admissions on the basis of two criteria: grade average of the Abitur and time of waiting. Special quotas exist for social hardship cases, for completing military service, for foreign students, for students preparing for occupations for which there is a special need, and for students transferring from Fachhochschulen. In the case of medicine, only students with an average of 1.6 out of 6 points (1 being the highest) in their Abitur results are admitted to medical faculties. The others must wait, sometimes for up to six years, for placement in a University.

In 1978, about 97% of Gymnasium and higher technical school graduates entered higher education. On the average, 95% of the pre-university year students successfully pass the Abitur,

although only 20% of the total 20-22 year old population actually enter higher education. Compared with Japan, the Soviet Union, and France, West Germany sends the lowest proportion of its youth to a university. However, all students who enter a university receive the same quality of academic training and upon completion of their study they receive a degree equivalent to a Master's degree at a United States university.

In summary, passing the Abitur is the general university entrance requirement in West Germany. In order to cope with the increase in secondary school graduates, additional admissions criteria are utilized, including grade point average, waiting time, and special hardship. In reality, the possible entrance to the university is decided as early as age 10 or 12 when the student chooses to enter a Gymnasium. In addition, the particular type of Gymnasium chosen determines the student's later direction of study and his or her choice of profession.

United States

In the United States, university admission requirements are as diversified as the institutions to which the student applies. In addition, high school curriculum requirements are not standard throughout the country. In contrast to all the previously described countries, open and selective university admission policies coexist in the United States. In many institutions, students are given the opportunity to prove their ability in the college classroom, rather than being selected solely on the basis of their secondary school performance. A high school diploma or an equivalent certificate is required. Other factors considered in the admissions process are secondary school grades, successful completion of specific secondary school courses, scores on achievement and aptitude tests, recommendations of high school teachers, and interviews with college admissions officers. The tests most frequently required are the Scholastic Aptitude Tests (SAT) and the College Board Achievement Tests. As mentioned earlier, the greatest difference between the German Abitur, the French baccalauréat, and the Japanese and Soviet university entrance examinations and the SAT is that the SAT attempts to assess general aptitude rather than achievement. Students do not pass or fail the SAT.

In 1980, about 75% of all high school graduates in the United States entered a college or university. In comparison to the other countries included in this study, the United States has the highest proportion of 18-year-olds pursuing a higher education. It also has the highest attrition rate. For example, 80% of those admitted to higher education establishments in the Soviet Union complete their undergraduate education and receive a diploma, while only about 55% of United States students who

enroll in college receive Bachelor of Arts or Bachelor of Science degrees. In the United States, just as in the other four countries, the probability of entering college at all -- and, in particular, of entering a competitive field within a prestigious college -- depends upon the type of subjects studied in high school, the quality of instruction in the high school, and encouragement from home. In addition, one's relative standing within the graduation class is important.

Another difference (see Burns, 1982, p. 43) is that in the United States individual teachers evaluate students against educational standards that are somewhat ambiguous. Standards are not established at the national level. In fact, each teacher and each school may have different standards.

Comparing the Incomparable

Comparing university admission requirements is useful only to a limited degree. There are three reasons why this is so. First, each education system has different underlying philosophies, different educational structures, and curricula. On the one extreme, Germany has a selective system where only a small proportion of a nation's youth reaches the point where they are allowed to apply to a higher education institution. In Germany, only 22% of the students finish academic secondary schools which provide nine years of college preparatory classes. On the other extreme, nearly every student in the United States and Japan graduates from high school, thereby fulfilling one basic college entrance requirement.

Second, unequal entities are being compared. The five nations' university admission requirements pertain to different age groups, which means students are at different developmental stages. In the Soviet Union, students may enter a university at age 17 after 10 years of schooling. In France and Germany, students must have completed 13 years of schooling, the last 7 years of which are comparable to college preparatory schools. On the average, French students are 18 years old. German high school graduates are 19 or 20 years old. In the United States and Japan, students graduate from high school at the age of 18 and may enter a college or university after 12 years of school. (Table 1 illustrates the percentages of various age groups entering higher education.)

Third, admission policies are constantly debated and frequently revised. All industrialized nations underwent major educational reforms in the 1970s; however, the available literature does not necessarily include updated information on admission policies.

Nevertheless, three general trends are evident among the five nations under study. In recent years, more attention has

Table . . Proportion of the age group with secondary school credentials qualifying for entry into higher education

University and non-university

	1970	Last year available	
Austria	15.3	(1978)	12.8
Canada	55.7	(1980)	62.4
Denmark	18.0	(1980)	25.4
Finland	20.6	(1980)	37.8
France	19.5[1]	(1983)	28.0[2]
Germany	11.3[3]	(1982)	26.3[4]
Italy	33.5	(1981)	38.8
Japan	74.2	(1981)	87.0
Netherlands	35.4[5]	(1981)	43.5[6]
Norway			
Arts Degree	23.1		
Diploma 11th and 12th year		(1980)	87.5
Portugal	16.3	(1979)	19.3
Spain	6.2	(1981)	24.1
Sweden	52.3[7]	(1982)	81.7[8]
Turkey	5.6	(1981)	10.5
England and Wales	21.4[9]	(1981)	25.8[10]
United States	75.7	(1980)	71.7
Yugoslavia	21.6	(1977)	32.8

1. Of which 16.2 per cent come from the Baccalauréat général and 3.3 per cent from Baccalauréat de T[illegible]cien.
2. Of which 19.7 per cent come from the Baccalauréat général and 8.3 per cent from Baccalauréat de [illegible]cien.
3. Of which 10.8 per cent qualified for education at university level and 0.5 per cent for non-university
4. Of which 19.7 per cent qualified for education at university level and 6.6 per cent for non-university level.
5. Of which 10.0 per cent qualified for university education and 25.4 per cent for non-university education.
6. Of which 11.6 per cent qualified for university entry and 31.9 per cent for entry into non-university institutions.
7. Of which 23.6 per cent come from 3/4-year lines of study and 28.7 per cent from 2-year lines of study.
8. Of which 31.6 per cent come from 3/4-year lines of study and 50.1 per cent from 2-year lines of study.
9. Of which 11.4 per cent qualified for university level studies and 10.0 per cent qualified for non-university level higher education.
10. Of which 13.1 per cent qualified for university level studies and 12.7 per cent qualified for non-university level higher education.

Source: Educational Trends in the 1970s, op. cit., Completed with information provided by national authorities.

Table 2. Enrolment rates of 18 and 19 year olds by level of education

Full-time (FT) and Part-time (PT)

		18 Years			19 Years		
		Secondary education	Higher education	Total	Secondary education	Higher education	Total
Austria (1981)		71.4	5.1	76.5	36.7	8.9	45.6
Australia (1981)	M	42.4	10.2	52.6	32.2	13.4	45.7
	F	21.6	10.8	32.4	15.1	13.9	29.0
Belgium (1981)[1]		79.7	20.3	100	53.3	46.7	100
Canada (1981)		22.9	19.2	42.1	5.6	24.4	30.0
France (1981)[2]		31.5	13.7	45.2	10.3	19.7	30.0
Finland (1978)		58.5	0.3	58.8	29.4	5.1	34.5
Germany (1981)	M	75.7	0.4	76.1	45.1	2.6	47.7
	F	66.9	0.2	67.1	38.4	5.1	43.5
Ireland (1979) FT only		13.6	12.5	26.1	1.9	14.2	16.1
Netherlands (1982)	M	60.9	7.8	68.7	36.9	14.8	51.7
	F	49.3	7.7	57.0	23.7	12.4	36.1
New Zealand (1982)[3]		8.9	23.6	32.5	4.3	26.6	30.9
Norway (1981)		56.0	0.6	56.6	24.1	5.5	29.6
Portugal (1977)		28.9	5.7	34.5	19.4	8.4	27.8
Spain (1979)	M	22.9	11.1	34.0	11.3	14.7	26.0
	F	22.5	10.9	33.4	11.4	13.9	25.3
Sweden (1978)		35.0	0.8	35.8	10.9	4.4	15.3
Switzerland (1982)		70.0	0.9	70.9	47.4	3.9	51.3
United Kingdom (1979)	M	34.7	9.3	44.0	20.3	12.4	32.8
	F	22.2	8.1	30.4	15.0	10.1	25.0
United States (1981)	M	22.2	35.1	57.4	5.1	37.6	42.7
	F	14.2	39.8	53.9	3.3	37.5	40.8

1. French and German speaking systems only. Figures refer to distribution of students and are not participation rates.
2. Figures under Higher education do not include some specialised commercial schools, health schools, etc.
3. Figures under Higher education include Technical Institutes and Teachers Training Colleges.

Source: Educational Trends in the 1970s, op. cit. Completed with information provided by national authorities.

Source: OECD Education and Training after Basic Schooling. Paris, 1985. pp. 118 and 47.

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Netherlands	35.4[5]	(1981)	43.5[6]
Norway			
Arts Degree	23.1		
Diploma 11th and 12th year		(1980)	87.5
Portugal	16.3	(1979)	19.3
Spain	6.2	(1981)	24.1
Sweden	52.3[7]	(1982)	81.7[8]
Turkey	5.6	(1981)	10.5
England and Wales	21.4[9]	(1981)	25.8[10]
United States	75.7	(1980)	71.7
Yugoslavia	21.6	(1977)	32.8

1. Of which 16.2 per cent come from the Baccalauréat général and 3.3 per cent from Baccalauréat de Technicien.
2. Of which 19.7 per cent come from the Baccalauréat général and 8.3 per cent from Baccalauréat de Technicien.
3. Of which 10.8 per cent qualified for education at university level and 0.5 per cent for non-university level.
4. Of which 19.7 per cent qualified for education at university level and 6.6 per cent for non-university level.
5. Of which 10.0 per cent qualified for university education and 25.4 per cent for non-university education.
6. Of which 11.6 per cent qualified for university entry and 31.9 per cent for entry into non-university institutions.
7. Of which 23.6 per cent come from 3/4-year lines of study and 28.7 per cent from 2-year lines of study.
8. Of which 31.6 per cent come from 3/4-year lines of study and 50.1 per cent from 2-year lines of study.
9. Of which 11.4 per cent qualified for university level studies and 10.0 per cent qualified for non-university level higher education.
10. Of which 13.1 per cent qualified for university level studies and 12.7 per cent qualified for non-university level higher education.

Source: Educational Trends in the 1970s, op. cit.. Completed with information provided by national authorities.

Table 2. Enrolment rates of 18 and 19 year olds by level of education

Full-time (FT) and Part-time (PT)

		18 Years			19 Years		
		Secondary education	Higher education	Total	Secondary education	Higher education	Total
Austria (1981)		71.4	5.1	76.5	36.7	8.9	45.6
Australia (1981)	M	42.4	10.2	52.6	32.2	13.4	45.7
	F	21.6	10.8	32.4	15.1	13.9	29.0
Belgium (1981)[1]		79.7	20.3	100	53.3	46.7	100
Canada (1981)		22.9	19.2	42.1	5.6	24.4	30.0
France (1981)[2]		31.5	13.7	45.2	10.3	19.7	30.0
Finland (1978)		58.5	0.3	58.8	29.4	5.1	34.5
Germany (1981)	M	75.7	0.4	76.1	45.1	2.6	47.7
	F	66.9	0.2	67.1	38.4	5.1	43.5
Ireland (1979) FT only		13.6	12.5	26.1	1.9	14.2	16.1
Netherlands (1982)	M	60.9	7.8	68.7	36.9	14.8	51.7
	F	49.3	7.7	57.0	23.7	12.4	36.1
New Zealand (1982)[3]		8.9	23.6	32.5	4.3	26.6	30.9
Norway (1981)		56.0	0.6	56.6	24.1	5.5	29.6
Portugal (1977)		28.9	5.7	34.5	19.4	8.4	27.8
Spain (1979)	M	22.9	11.1	34.0	11.3	14.7	26.0
	F	22.5	10.9	33.4	11.4	13.9	25.3
Sweden (1978)		35.0	0.8	35.8	10.9	4.4	15.3
Switzerland (1982)		70.0	0.9	70.9	47.4	3.9	51.3
United Kingdom (1979)	M	34.7	9.3	44.0	20.3	12.4	32.8
	F	22.2	8.1	30.4	15.0	10.1	25.0
United States (1981)	M	22.2	35.1	57.4	5.1	37.6	42.7
	F	14.2	39.8	53.9	3.3	37.5	40.8

1. French and German speaking systems only. Figures refer to distribution of students and are not participation rates.
2. Figures under Higher education do not include some specialised commercial schools, health schools, etc.
3. Figures under Higher education include Technical Institutes and Teachers Training Colleges.

Source: Educational Trends in the 1970s, op. cit. Completed with information provided by national authorities.

Source: OECD Education and Training after Basic Schooling. Paris, 1985. pp. 118 and 47.

been focused on obtaining high school diplomas or school-leaving certificates with a high grade point average, rather than on just fulfilling the basic requirements. Both the curricular content of secondary school courses and the grades obtained have become important. In recent years, all five countries have made efforts to open higher education to those with qualities not previously recognized as valid, either by implementing new types of higher education institutions (e.g., University Institutes of Technology (IUT) in France, the Gesamthochschule in Germany, and many evening and correspondence studies in the Soviet Union) or by establishing new entrance criteria (the technical baccalauréat F in France, the "limited" Abitur of the Fachoberschule in Germany). During the last 15 years, all five nations have started to employ two kinds of selection mechanisms: formal requirements and additional selection devices and instruments. These additional mechanisms include asking for more mathematics as is the case in France, considering the grade point average of the Abitur in Germany, and giving preferences to applicants from schools in the same states as is done by the University of California.

High School Graduation Achievements

An interest in comparing required and attained achievements in mathematics, science, nd a foreign language upon completion of high school in industrialized countries is understandable because educators and policy-makers want to find out how other industrialized countries cope with the problems facing them. In comparing educational standards and outcomes, one is faced with many of the same difficulties as described in the previous section. Curricula of different types of schools and achievement levels of graduates of various ages are compared. In addition, secondary school graduation requirements within any one country are numerous. One cannot hope to get an accurate assessment of students' academic attainment because official curricular requirements do not reveal what is actually taught by the classroom teacher or what is actually learned by the students.

The literature that looks at required high school curricula compares numbers of years a subject is studied in each country. The underlying assumption is that equal amounts of particular topics are covered in each country each year; however, the number of hours each topic is studied each year differs significantly. Students in the Soviet Union go to school six days a week. Japanese high school students do a considerable amount of homework, possibly 4-5 hours daily. West Germany's Gymnasien offers each subject only 2-4 hours a week.

The only studies which compare achievement levels in different countries are large-scale studies of the International Association for the Evaluation of Educational Achievement (IEA, 1962-1976). They are cross-cultural studies focusing on how schools contribute to shaping the cognitive development of children in different countries. Although the methods and results of the studies were widely discussed and heavily criticized, they are still used today to compare achievement levels. Most of the reports presented to the National Commission on Excellence and recent studies on foreign educational systems refer to these IEA studies. Due to the lack of more accurate material, the findings of the IEA studies are presented to give some information on comparative achievement levels.

This study focuses on mathematics, science, and foreign language curricula of the Soviet Union, Japan, and West Germany. The most detailed information available is on mathematics education. At present, the only literature on the French baccalauréat requirements is in foreign languages and biology. References to the United States will pertain to course requirements or to SAT scores.

Since the focus of this study is on the transition from secondary to higher education, this report limits itself to

secondary schools that lead directly to university entrance. In the case of France and West Germany, the entire sector of upper-secondary vocational/technical schools is excluded.

Mathematics Achievement

Soviet Union

An SRI International study (1980, updated 1982) by Catherine Ailes and Francis Rushing reports that at the end of the 10th grade, Soviet students have completed four years of algebra, two years of plane geometry, and two years of calculus. By the end of the 8th grade, students have studied simple experimental and logarithmic functions and their graphs; equalities and inequalities; exponents (integral and rational); poly-nominals; rational expressions; absolute and relative errors; linear and quadratic equations; and digital computers. Geometry, which is actually studied concurrently with algebra, focuses on plane geometry in grades 7 through 8; a vector-based approach is used in grades 9 and 10. The study of algebra and analysis includes calculus and probability theory (Eckstein, Travers and Shafer, 1982). This curriculum applies to all students in this grade.

The greatest contrast between the overall curriculum in the United States and Soviet Union is the Soviet emphasis on science and mathematics and the grades at which these courses are introduced. (Figure 5 summarizes the Soviet curriculum for grades 1-10.) Findings from a sample survey in the United States show that over 56% of the United States school systems require no or only one mathematics course for graduation. Changing enrollment patterns for courses in secondary schools in the United States do seem to reveal more and better mathematics training for some students. These students generally complete a calculus course and perhaps a course in probability and statistics. For most students, the general level of education in the United States seems to include some training in general mathematics, geometry, and algebra.

Ailes and Rushing, as well as Burn and Hurn in their report, "An Analytic Comparison of Educational Systems" (National Commission on Excellence in Education, 1982), warn that the mathematics/science orientation of the Soviet general curriculum does not necessarily result in a high level of competency among the total population. There seems to be a wide disparity in the quality of instruction between urban and rural schools (see R. Dobson, 1982) and between Russian and non-Russian southern republics. Further, the student/teacher ratios are 30-40 students for each teacher. Many schools have inadequate facilities, particularly laboratories. Still, the literature on the Soviet Union unanimously agrees that Soviet secondary school students receive a far better preparation in mathematics than do students in the United States. (See also Zajda, 1980 and Mathews,

Subjects / Grades	Primary School				Eight-Year School				10-Year Complete Secondary School		Total Weekly Hours
	I	II	III	IV	V	VI	VII	VIII	IX	X	
Russian language	12	11	10	6	6	4	3	2	-	-	54
Literature	-	-	-	2	2	2	2	3	4	3	18
Mathematics	6	6	6	6	6	6	6	6	5	5/4	57.5
History	-	-	-	2	2	2	2	3	4	3	18
Basics of Soviet Government & Law	-	-	-	-	-	-	-	1	-	-	1
Social Science		-	-	-	-	-	-	-	-	2	2
Natural Science	-	1	2	1	-	-	-	-	-	-	4
Geography	-	-	-	-	2	3	2	2	2	-	11
Biology	-	-	-	-	2	2	2	2	1	2	11
Physics	-	-	-	-	-	2	2	3	4	4/5	15.5
Astronomy	-	-	-	-	-	-	-	-	-	1	1
Drawing	-	-	-	-	-	-	1	1	-	-	2
Foreign language	-	-	-	4	3	2	2	1	1	1	14
Chemistry	-	-	-	-	-	-	2	2	3	3	10
Fine Arts	1	1	1	1	1	1	-	-	-	-	6
Singing and Music	1	1	1	1	1	1	1	-	-	-	7
Physical Training	2	2	2	2	2	2	2	2	2	2	20
Manual Training	2	2	2	2	2	2	2	2	4	4	24
Primary military training	-	-	-	-	-	-	-	-	2	2	4
Total required courses	24	24	24	27	29	29	29	30	32	32	
Elective courses							2	3	4	4	13
Grand Total											

Source: Courtesy of Professor Nicholas DeWitt, National Academy of Science, National Research Council; forthcoming report on Science Education in the USSR.

Figure 5 TYPICAL USSR GENERAL EDUCATION SCHOOL CURRICULUM (GRADES 1-10), PROPOSED FOR 1980/81

1982.) Soviet education policy is oriented towards "a rapid transformation of the economy to a scientific-technical base." Consequently, the school curriculum emphasizes a narrow specialization in math and science for all students.

Japan

In Japan, just as in the Soviet Union, West Germany and France, the curricula is prescribed by the Ministry of Education. All Japanese public and private schools have to follow it. Students who intend to take university entrance examinations have to complete three mathematics courses. These mathematics courses are offered in sequence and are not limited by the length of a school year. Topics from algebra, geometry, analysis, probability, statistics and differential and integrated calculus are integrated in a coherent system. In the United States, algebra I, geometry, and algebra II are introduced step by step and not integrated as in Japan and the Soviet Union. In Japan, four weekly periods of 50 minutes each are devoted to mathematics in grades 7 through 9, six periods in grade 10, and 5 periods per week in grades 11 and 12.

Eckstein, Travers and Shafer describe an additional "Science-Mathematics" program leading to specialization in natural science and mathematics. In the 11th and 12th grades, this sequence is studied for 13 to 18 hours per week and includes "actual experience in preparing programs for the computer, running them and analyzing the results" (p. 32).

According to the IEA Mathematics Study, in 1964 Japan ranked number one in terms of mathematics achievement both of 13-year-olds and seniors in high school in 1964 (see Table 2). The Soviet Union was not included in this study. The literature suggests that much of the success of Japanese mathematics education is due to the personal interaction between teachers and students. Overall, it seems that the pace of mathematics instruction is faster in Japan and the Soviet Union than in the United States.

Federal Republic of Germany

At the end of Gymnasium, German students usually have covered algebraic functions, differential and integral calculus, statistics, probability and vector analysis. Starting at grade 5 or 7, mathematics is taught in an integrated way.

Since different types of Gymnasien emphasize either modern languages, classics, or math and science, it is not possible to give a more detailed description about overall mathematics requirements. Moreover, each of the 11 Laender (states) determines its own curricula.

Table 2
Achievement in Mathematics by Thirteen-Year-Olds, 1960–1964

Nation	*Mean*	*Coefficient of Variation*
Japan	31.2	.542
Belgium	27.2	.542
Finland	24.1	.411
The Netherlands	23.9	.665
Australia	20.2	.693
England	19.3	.881
Scotland	19.1	.764
France	18.3	.678
United States	16.2	.821
Sweden	15.7	.689

SOURCE: Torsten Husen, ed., *International Study of Achievement in Mathematics: A Comparison of Twelve Countries*, vol. 2 (New York: John Wiley and Sons, 1967), p. 22.

The literature concludes that the Soviet Union and Japan and, to a somewhat lesser extent, France and West Germany place a high emphasis on mathematics instruction in college preparatory schools.

Science Achievement

Soviet Union

Science instruction in the Soviet Union also contrasts with science education in the United States. In the Soviet Union, biology is required two days per week in grades 5 through 10. In addition, students study physics two days per week in grades 6 and 7, and three, four, and five hours per week in grades 8, 9 and 10. Chemistry is introduced in grade 7 and is taught two hours weekly through grade 8. In grades 9 and 10, chemistry classes increase to three hours weekly. Astronomy is required in grade 10. The requirements in geography are equal to that of biology, two hours per week over a period of five years (P. Dehart Hurd, 1982). Soviet students have no choice in selecting science classes; hence, all students are exposed to a strong science curriculum.

United States

Students in the United States choose among different science courses. The most common science courses offered in grades 7-9 are general science, earth science, life science, physical science, and biology. The SRI International study (1982) reports that "general science is the only science course offered by more than 50% of all schools with grades 7-9. In grades 10-12, the most frequently offered courses are biology, chemistry and advanced biology. However, only a few students take chemistry and very few of only the most able students take physics" (p. 4).

Japan

In Japan, all students in grades 7, 8 and 9 take four hours of science per week. The courses consist of introductory topics in biology, physics and chemistry. In the standard senior high schools (grades 10, 11 and 12), all students are required to take five credits of physics, four of chemistry, four of biology and two of earth science (P. DeHart Hurd, 1982). A credit equals 35 school hours.

Federal Republic of Germany

In West Germany, biology, geography, physics and chemistry are required subjects in grades 5 through 11. As a rule, students are instructed in these subjects two hours per week. Starting with grade 12, students have some choice in selecting

science courses. They must elect one science subject (physics, biology or chemistry) and study it intensively six hours per week for at least one year. In addition, they must choose another elective course to study two hours per week. Electives may include geology, astronomy, technology, statistics, or data processing.

To illustrate the level of required achievements, an example of biology questions of the Abitur is presented. William Meyer, Director of Biological Sciences Curriculum Study (1982), reports that students who choose to specialize in biology are primarily asked questions in the field of genetics, biochemistry (enzyme synthesis) and ecology. "The questions give pedigrees to work out, request models to be sketched and provide quantitative data with which to deal. They are experimentally based and the students must demonstrate how they handle data in deriving the answers called for" (p. 52). For example, one question asks students to determine the order of a specific group of genes from the data given and then to defend the answer in terms of the procedures used.

France

The only information available on science requirements in France is an example of baccalauréat questions in biology. The topics range widely from ecology, microbiology, cell biology, endocrinology, physiology, genetics, neurophysiology, spermatogenesis, electron microscopy, radioactivity, genetic pedigrees to respiration. The students are asked to demonstrate their abilities by interpreting experimental evidences, analyzing experimental data, and formulating hypotheses. William Meyer (1982) compares these examination questions to questions asked on written preliminary doctoral examinations in the United States. He infers from the questions that French students must be well grounded in the discipline and able to organize information in response to specific situations. He comments that "it is taken for granted that the students will have sufficient written command of the language and ability with it to provide a coherent, legible, meaningful essay" (p. 46).

In summary, science is required of all students and at every grade level in the secondary schools of the Soviet Union and Japan. In France and West Germany, students have a choice of electives for the last years of high school. Courses extend over a period of several years; however, they rarely meet five days per week as is the case in the United States. Paul DeHart Hurd (1982) compares students in the United States who elect to take three years of science in high school with students in the Soviet Union, Japan, and West Germany, who take the required science courses during three high school years. He concludes that, based on the total number of class hours devoted to science in the

Soviet Union, Japan and West Germany -- and France can easily be included -- students in these nations have approximately three times as many class hours of science as students in the United States. DeHart Hurd further notes that teachers in these countries emphasize the interconnectedness between science subjects, between science and mathematics, and between the natural and social sciences.

Foreign Language Achievement

The IEA studies on the teaching of French and English as a foreign language in selected countries found that the first and foremost factor contributing to the different achievement levels of pre-university students was the time spent studying foreign languages. That includes both the number of years and hours per week devoted to the study of a foreign language.

United States

American high schools offer the least amount of foreign language studies. Colleges in the United States require the lowest level of foreign language proficiency. On the average, college-bound students take two years of a foreign language.

Soviet Union

The available information (Zajda, 1980) indicates that Soviet students have five years of foreign language training. In non-Russian schools in the Soviet Union, children are required to study three or more languages: their native tongue, Russian, and a foreign language, usually English.

Japan

In Japan, English is the most commonly taught foreign language. High school students study English five hours per week for three full years. Rohlen (1983) remarks that on the average, Japanese people cannot speak English well, but their knowledge of written English is better than the average foreign language ability of American college graduates. This may be related to the fact that the university entrance exam does not include an oral English component.

France

French graduates from a Lycée have completed seven years of foreign language training, usually English or German. According to the type of Lycée, one or two additional languages are required, usually Latin, German, or English.

Judging by the information available, the French baccalauréat examination in foreign languages attempts to certify

intellectual readiness for university work. The foreign language baccalaureat consists of three parts: a text which has to be commented on; a set of questions in the foreign language to be answered in that language on the same text; and a translation of approximately half the text into French. The texts are taken from literary pieces, chosen from works of fiction or serious works of non-fiction, and from periodicals like Time or the Guardian. Like the Japanese examinations, there is no oral component in the baccalaureat. A university-bound high school graduate is expected to have a functional command of the foreign language sufficient to read, comprehend, and discuss a serious text of moderate length.

Federal Republic of Germany

West German Gymnasium graduates are required to study at least two foreign languages. At graduation, students of the mathematics/science and the modern language type of Gymnasium have studied English four hours per week for nine years. In addition, the modern language-oriented Gymnasium requires at least five years of Latin and four years of French. Students of the classics-oriented Gymnasium usually have seven years of Latin beginning in grade 5, four years of ancient Greek beginning at grade 8, and four years of English.

After nine years of English, the Abitur requires "a thorough knowledge of the language upon which is built a sophisticated understanding of the principles of literary interpretation and analysis of ideas, with a solid grounding in the specifics of the literature of the target language" (R. Brod, Modern Language Association of America, 1982). Unlike the baccalauréat, in some states the Abitur has no translation section and the entire examination has to be written in the foreign language.

Paul DeHart Hurd (1982) views foreign language requirements in the Soviet Union, Japan and West Germany as a means of qualifying students to tap the world's resources of scientific and technological information, whereas the emphasis in the United States is on enabling students to speak a foreign language well.

Conclusion

Comparisons of U.S. education with systems of education in other industrialized countries are always in demand whenever the U.S. economic or technological superiority in the world economy is in question. We all remember the era of the Sputnik shock of the 1950s when the launching of Sputnik by the Soviet Union was ascribed to superior education in the Soviet Union. American schools were accused of a lack of intellectual rigor and standards. They were regarded as inferior, especially in science and mathematics education. This interpretation seemed to be confirmed by the first International Mathematics Survey in 1967 which revealed that 13 and 18 year-olds in the U.S. scored lower in mathematics than those in all of the other countries studied. Despite serious flaws and limitations, this study and others of the same series, all received great public attention in the U.S. and many other countries. Torsten Husen, the first director of the International Association for the Evaluation of Educational Achievement (IEA), points out that these studies did not relate national characteristics of educational systems to the students' performance. Despite the efforts by researchers to point out that the differences in national scores are due to differences in structure and selectivity of the educational systems as well as to the impact of social and economic differences in student competence, the outcry by educational policy makers in many countries was tremendous. Policy makers ignored this and interpreted differences in average performance between countries as due to differences in efficacy of mathematics education.

In the 1980s the national spotlight focuses again on the quality of education in the U.S. This time the concern is somewhat different. The competitiveness of U.S. high technology products is declining. And this time it is not the Soviet Union but Japan, which causes concern. Again, the interest in cross-national studies has increased. The second round of large-scale international educational achievement studies is on its way. Past criticisms were incorporated into new study designs and the new foci are on the curriculum, the classroom, and the student. Preliminary results, taken from the perspective of other nations, show that the 8th grade mathematics curriculum in the U.S. "looks more like a program of studies for the end of elementary school than for the beginning of high school."* In the final year of secondary school mathematics, students in the U.S. sample performed markedly below students of the same level in other nations. This study also compared changes in achievement scores of U.S. students over time. Overall, achievement scores of U.S. students in college-preparatory mathematics have increased modestly since the last international assessment in 1967, yet mathematics achievement of U.S. 8th graders declined slightly.

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*Travers and McKnight, 1985, p. 409.

Surprisingly, the Second International Science study found that the science achievement of 5th and 9th graders in the U.S. improved considerably between 1970 and 1983. Comparing achievement scores over time within one country and relating that to changes within other nations is relevant information for policy makers and curriculum specialists. At present, however, only preliminary results in mathematics and science are available.

Although it is regretable that more studies which compare change rates of students' achievement over time have not been launched, we must not forget that it is the underlying structure and value of education in these five countries which make it difficult to compare achievement tests in any meaningful way.

The most profound difference between the education systems of the United States and those of West Germany, France, Japan and the Soviet Union is that secondary schools and colleges in the United States are accessible to a larger population of students. This reflects these countries' different societal values. In the United States, equity, practicality, and individualism are prevalent values. In addition, governmental authority is often viewed with suspicion in the United States. These values are mirrored in the public school system, which lacks directly selective examinations during elementary and secondary education, operates as a decentralized system, and offers vocational subjects in high school. In the United States, public schooling is viewed as an instrument to erase or neutralize class distinction, yet tracking is viewed by some as an internal selection system.

In contrast, until the 1960s, France and West Germany had an elite, selective school system based on the assumption that employing fair and uniform criteria of excellence would open the avenues to high status occupation to everybody who possesses the necessary talent and energy. Students who possess strong academic potential are separated early and taught a separate curriculum. These students are destined to produce high academic achievements; but the high achievements of a few are bought at the price of excluding a significant number of students from the lower social strata from academic education. Since the 1960s, traditional Western European structural patterns are changing and the educational philosophy is moving closer to American values of ensuring equal opportunity.

Another distinctive feature of American education is that schooling is viewed as a resource which helps to meet one's own objectives of personal fulfillment and self-realization. Moreover, the United States educational system tries to satisfy an ethnically diverse population. In the other four industrialized countries, education has the accepted function of awakening in

the student a sense of his or her participation in and relationship to a national community and a national tradition. In Japan, for example, developing loyalty to one's school and deference to the school authority is part of building a common spirit, which values loyalty to society and deference to authority. In the Soviet Union, schools are expected to prepare the individual for a career that aims to fulfill collective societal goals.

Further, there is a difference in the ways in which education is governed and financed in the United States and the four other countries. The Soviet Union, France, and Japan are highly centralized systems where virtually every important educational decision about school organization, the curriculum, and personnel policies are made at the national level. Only West Germany has a mixed regional and state central system. In all of these countries, tenured teachers are civil servants, with a life-time income and pension paid by the central government or by the state government. Teachers in these nations operate without much interference from parents or the local community.

One of the most remarkable differences between the United States educational system and those of the other four countries concerns examinations. In the other four countries, access to higher education is controlled by national examinations which are based upon national academic standards. In the United States, educational institutions are more accessible and movement between institutions is possible. Ideally, students can move from a community college to a university or from one university to another.

The American college entrance tests, such as the SAT, are not closely linked to the curriculum and are not designed to be taught. The SAT assesses academic achievements as well as potential; it does not serve as an incentive to perform better in school. This stands in sharp contrast to the university entrance examinations in Japan and the Soviet Union and to the school exit examinations in France and West Germany where these examinations dominate the lives of college-bound students and their teachers.

The puzzling question for education policy makers is how can countries with such different educational systems, and such sharp differences in levels of achievement and age profile of achievement, be so similar in level of economic development?

We probably will never find a completely satisfactory answer to this question. But certainly any explanation must address the underlying values and goals of the education systems of the five nations. Policy makers must ask the following questions. How does each system prepare its students for work? Who makes the decisions concerning university admission requirements, curriculum, teacher appointments, and educational facilities? Who finances the schools and universities? At what point in a student's life

must he or she make a crucial educational career decision? Where do we find the 18 year-olds in Germany, France, Japan, the Soviet Union, and the U.S.? Are they still in school? In what kind of school? Or are they already at the university, at work, or unemployed?

Education policy makers need to focus on how the existence of a college entrance exam or secondary school exit exam affects the educational standards of the secondary school, rather than focusing more narrowly on university entrance requirements. Such a comparative approach sheds more light on the factors which influence student achievement than international comparisons which have the sole purpose of finding out whether one nation's scores are higher than the others. We then find that U.S. high school graduates are neither well prepared to enter college, nor are they really prepared to enter the work place. About 40% of California's high school graduates, for example, start working immediatly after high school graduation. In Germany, France and the Soviet Union, however, the majority of students, who do not enter higher education (between 80 - 60%) are well prepared to enter the work force, and those who go on to higher education are well equipped to enter the university. As a result, German universities do not need to offer remedial courses.

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